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A PRELIMINARY PAPER UPON THE CAUSES OF
LATERAL CURVATURE OF THE SPINE; WITH
THE REPORT OF A CASE OF LATERAL DE-
FORMITY DUE TO OCCUPATION.

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THE great variety of opinions and theories that exist regarding the etiology and pathology of lateral curvature of the spine, with and without rotation, leads me to place upon record the following case. It presents many interesting points, and illustrates a form of curvature which, I think, has not been fully described, although the causes which produce it, in this individual case, are those most frequently cited by various eminent writers on the subject of scoliosis.

Lateral curvature of the spine has been written upon by so many eminent men, and the subject has been so frequently reviewed, that it may be well, before recording the case that will form the basis of my remarks, to state that I have nowhere seen that lateral curvature has been subjected to the close scrutiny which many other conditions have undergone. I regard this fact as indicative of the lax way in which all strictly objective conditions are regarded. If true scoliosis were accompanied by pain or by extensive destruc-

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tion of tissue, or by any serious complication, I feel that the causes producing it would have received the attention which they deserve. It is only fifty years ago, for example, that club-foot escaped from the realm of the charlatan to the domain of scientific surgery. Within a few years only has knock-knee received the surgical as well as the mechanical attention which it requires, and, although true scoliosis received much attention several years ago, and especially from the French Academy, and many muscles were divided in the attempt to make myotomy answer, in this condition, the purpose of tenotomy in club-foot, the attempt was long since abandoned. True scoliosis, therefore, has little to recommend it to the general or operative surgeon. The requirements of its treatment are almost wholly mechanical, and the most intricate problems in its etiology and pathology still remain unsolved.

Therefore, in dealing with this subject wherein there is so much uncertainty regarding the pathology, and the etiology of which is so obscure, I have thought it well to study the matter from a clinical standpoint until such time as actual post-mortem exploration shall settle certain vexed questions, and, in so doing, I have been able to clearly define eight different varieties of lateral curvature of the spine, each with a distinct etiology, and with easily demonstrated clinical features that should enable the careful observer to differentiate between the several forms.

The varieties are as follows :

1. The true scoliosis, with rotation of the vertebræ.
2. The hysterical imitation of the true curve.
3. The incidental curve due to an unequal length of the lower extremities, etc.
4. The curve due to unilateral lung or pleural disease—first described by Dr. Little, of London.¹

¹ "On Spinal Weakness and Spinal Curvatures." By W. J. Little, M.D. Longmans, Green, & Co., London, 1868.

5. The curve, with exaggerated rotation, due to infantile paralysis—first described, I believe, by the writer.¹

6. The lateral curve, which accompanies the first stage of Pott's disease² in the lower and especially the last lumbar vertebræ. To this may be added the lateral deviation that may occur in any case of chronic spondylitis.

7. The rachitic curve ; and

8. The curve due to an atonic condition of the fibrous and muscular tissues in the adolescent when prolonged mal-position is maintained, as a matter of occupation especially.

I have had ample opportunities for observation in all of these conditions except the last-named, and the object of this paper is to place upon record a case of lateral curvature due to weakened tissues and habitual mal-position, and to point out the clinical features that characterize that condition.

John L., aged seventeen, born in Ireland and residing in New York, presented for examination at the N. Y. Orthopædic Dispensary on Feb. 4, 1884. The hereditary history shows that his father died of phthisis ; his mother is living, and seemed, when the patient was examined, in good health. One sister of the patient has hip-joint disease, one brother is now suffering from inflammatory rheumatism ; two brothers are dead from causes unknown. No other facts bearing on heredity could be ascertained.

The patient is a very poorly nourished lad ; he has a slight amount of ectropion ; his lips are large, thick, and almost colorless ; and his nutrition is generally bad. Two years ago, the patient, then fifteen, and apparently straight, entered the service of a grocer in this city as an errand or delivery boy. His employer did not use a horse and wagon for delivery, and all goods delivered were carried by this boy in a basket. The work was laborious and the hours long. In order to facilitate the carrying of the numerous parcels entrusted to him, many of which were

¹ "Pott's Disease, its Pathology and Mechanical Treatment, with Remarks on Rotary Lateral Curvature." By Newton M. Shaffer, M.D. G. P. Putnam's Sons, N. Y., 1879 ; also, a Lecture on Lateral Curvature of the Spine. By the same author. *N. Y. Medical Gazette*, April 2, 1881.

very heavy, the patient habitually threw his body forward and to one side, hooking his right arm through the handle of his basket, and supported his burden upon the right ilium; he was in this position a good deal of the time, and, after working steadily for about seventeen months, he began to experience pain in the "right hip" (iliac region), and his friends noticed that he was becoming crooked. As his wages, however, were the chief dependence of his mother's family, he continued his work, disregarding the pain and the increasing mal-position. The pain began to increase, and to trouble him somewhat when he arose in the morning, or upon changing his posture after a period of rest; he found that he could not sleep upon his right side on account of the pain so caused; he began to limp, "favoring" the right leg, and as the pain and mal-position increased, he was at length obliged to abandon his work and to seek medical advice.

He first consulted a physician who thought he might have hip-joint disease and referred him to Dr. I. Adler, who eliminated hip disease and sent the patient to the Dispensary. Upon examination, it was found that the pain was referred to several places: 1st, in the back (dorso-lumbar region); 2dly, to the right ilium and especially at the crest, posteriorly, where he had borne his burdens; also in the region of the hip; and 3dly, along the course of the sciatic nerve on the right side. The pain was always "in the back" simply, or "in the hip." None of our inquiries gave rise to any more exact or explicit statement. There were no points of tenderness along the spine; pressure giving negative results. There was no evidence of chronic spondylitis, sacro-iliac disease, or morbus coxarius. The spine was normally flexible antero-posteriorly. There was no marked lateral resistance on either side in the dorsal region, and a pronounced lateral curvature (see engraving) with a very marked prominence of the right ilium, posteriorly. The last was a marked feature of the case. On a casual examination it seemed almost as if there were a bony growth at the posterior iliac spine—which impression was strengthened, if any thing, by comparison and palpation.

After repeating the tests above mentioned, with the same results I directed the patient to lie down in the prone position. The iliac prominence was then greatly modified, and the spinal curvature much reduced. Gentle traction was then made, one assistant pulling at the axillæ and another at the ankles. After a moment's traction the curvature practically disappeared and the iliac prominence was very greatly reduced. There was no undue rigidity of

the spine, as already mentioned, and, as stated, the application of gentle force sufficed to remove all the essential features of deformity.



The patient was then tested as to the peculiarities of the lateral curvature of the spine. The lower extremities were of equal

length and this element of mechanical etiology was eliminated. The curve in the lower lumbar region was very short and slightly to the right ; it then passed by a long sweep to the left, forming a compensatory curve in the dorsal region. The right shoulder was depressed and there was a slight difference in the scapulæ, the left being somewhat higher. There was a very slight degree of rotation of the dorsal vertebræ toward the left side. Putting the patient to the test of extreme anterior flexion (Adams' test) it became almost straight, and there was then noticed a slight rotation at the lower (lumbar) curve, toward the right side. When the patient was placed in the prone position and traction made, the dorsal and lumbar rotation disappeared. None of these tests gave pain, and there was no evidence of reflex muscular spasm, such as is seen, for example, in chronic spondylitis or in hip-joint disease. Gravity as an etiological factor being removed, the spine, on slight traction, returned in a very brief time to a nearly normal position. All the prominent features of the deformity recurred when the patient reassumed the erect posture. The patellar tendon-reflex was slightly exaggerated on both sides, as were also the other reflexes below the diaphragm. The curve had existed for seven months, during most of which time the patient, with no improvement as to his condition and without modifying his efforts, had continued to work as described above. He was finally compelled to desist by pain and debility, and not by the increasing deformity.

Had this lad been engaged in an occupation that necessitated prolonged standing, instead of walking with his spine distorted, he would probably have developed adolescent knock-knee or flat-foot,—so frequently seen among boys of his age. Be that as it may, he came to us with a deformed spine which presented the features described, and which we have attempted to show in the engraving.

Among the many causes that have been assigned for lateral curvature—the true scoliosis of growing girls with rotation—there is none that is oftener dwelt upon, perhaps, than habitual mal-position. The patient, for example, has been observed to stand habitually, with the weight of the body supported by one limb ; or the posture of the subject

at the school-desk has been observed as awkward, or somewhat out of normal; and these or similar causes have been accepted as the important etiological factors in true scoliosis. My friend, Dr. W. J. Little, of London, has very recently stated his views upon this subject, and, as they may be accepted as representing a large class of readers and thinkers, it may be well to state them here. Dr. Little says, in his excellent and exhaustive treatise on "The Medical and Surgical Aspects of In-knee (*Genu Valgum*)," (page 18,) speaking of knock-knee: "In adolescents, it is probable that carrying heavy weights, fatigue, and long hours of work have their principal share in its production, favored in fast-growing lads by insufficient diet and consequent weakness of tissue." Again, page 99, he says: "Nature or gravity works in the lower extremities exactly as in the spinal column afflicted with scoliosis or twisting of the spine, which, we have already stated, is a strictly analogous distortion to in-knee, occurring in distinct forms,—the atonic and rachitic."

The case we have placed upon record would sustain these views, if the history so recorded were the history obtained in true scoliosis with rotation. The present is, however, a very exceptional case in our experience, but, so far as it goes, it corroborates the views of Dr. Little, as above quoted, and no one will deny, I think, that the conditions named by him may produce lateral curvature. Instead of resulting in true scoliosis, however, we have the condition, aptly called by Dr. Ketch, of the Dispensary, "a grocer boy's back."

My friend, Dr. Seguin, has also recently verbally described to me a condition which may be called an "office boy's back," wherein the deformity resulted from carrying bank or other heavy ledgers, etc., and, while it would be

impracticable in this paper to point out the differences between this curvature and the other curves, to which we have alluded in our classification, it might be well to state briefly the chief differences between the "grocer boy's back," and that found, for example, in growing girls with rotation.

In my monograph on Pott's disease already referred to, I call attention to the fact that permanent lateral curvature with rotation does not result from inequality in the length of the lower extremities, after such disabling conditions as morbus coxarius, and infantile paralysis of long standing. I have had, since the monograph was written, opportunities to observe many cases of adolescent girls with suppurative hip-joint disease, wherein the affected limbs have been shortened practically from three to five inches or more. In these cases, the prolonged suppuration produced just that atony of the fibrous and muscular tissues that Dr. Little and others place so much stress upon, and the habitual mal-position (also prolonged) was always present when the patients stood or walked. None of these cases have developed any thing more than the incidental curve (the third of my classification). All evidences of curvature disappeared in these patients when they were placed in the prone position. Most of them complained, as did John L., of pain somewhere in the back. It has appeared to the writer, therefore, that even atony with prolonged mal-position is not a very frequent cause of true lateral curvature with rotation. The cases are exceptional, I think, wherein these causes produce a permanent curve, *i. e.*, one not obliterated by recumbency, or, as in the case of John L., by recumbency and slight traction.

And this brings us to speak of the principal features in true lateral curvature with rotation. There are many matters that we cannot touch upon on this occasion, and we

will refer only to those involved in this case. The first is the permanency of the curve—and the permanency of the rotation, even if slight in true scoliosis. If we place the patient in the position of extreme anterior flexion, with even a slight curve and slight rotation, instructing the patient to attempt to touch the toes with her fingers without bending the knees, the curve remains the same, or is slightly increased, and the rotation is exaggerated. In the case of John L., the lateral element almost wholly disappeared during this test, as did the dorsal rotation. The rotation in the lumbar region, which was slight, and out of all proportion to the curve, became slightly exaggerated, as was to be expected, as this was the point of true curvature, those above being secondary.

If we place a patient with true scoliosis in the prone position, the antero-posterior curves become modified, as do also the compensatory lateral ones, but the true lateral and rotary elements do not alter even with traction. In other words, we have a structural change in the muscles in true rotary lateral curvature, with, of course, changes in the vertebral bones, which, I think, are secondary. In the case of John L., there is an atonic condition only, without, I believe, structural change in the muscular or fibrous tissues. In true scoliosis there is a permanent, progressive curve, involving especially the *intrinsic* vertebral muscles, while in the case here recorded there seems to be *extrinsic* disturbance only. Ether given to the true scoliotic would fail to modify the curve; if administered to John L. it would have removed the curve at once (inasmuch as recumbency and slight traction did so), though it had existed for seven months or more. In the former condition there is a permanent loss of equilibrium between antagonistic muscles; in the latter the disturbance is almost entirely, if not wholly, functional.

Let me ask those who accept and teach the mechanical

etiology of scoliosis, why it is that the curve and twisting occur most frequently in the mid-dorsal region. The thorax forms a pedestal for extensive extrinsic muscular action,—and none of these extrinsic muscles are in a position to produce a thoracic or vertebral deformity, unless their distal extremity becomes a fixed point. Again, there is scarcely any motion at the first five dorsal vertebræ, and the remaining ones—down to the tenth dorsal vertebra—also possess very little mobility. The location of these ten vertebræ, their costal as well as their ligamentous and muscular attachments, the shape of their inter-vertebral discs, their almost interlocking spinous processes, their vertical articular processes, and their situation as regards the centre of gravity (which passes anteriorly to the bodies, in the mid-dorsal region, in the erect position),—all tend to make this the region of the least mobility in the whole spinal column. If the primary curvature were to occur in this region from gravity, would it not be a *posterior* one, as in chronic spondylitis,—this being the normal direction of the spinal curve at this point? And would not the curve occur, if gravity were the factor, at the point of the least resistance, rather than at the point of the greatest resistance—in other words, between the thorax and the pelvis, as it did in the case here recorded? And yet, true scoliosis, with twisting, occurs most frequently in this mid-dorsal region, where there are so many obstacles to its occurrence. To make gravity, with predisposing atonic conditions, accountable for a curve which finds its principal expression at this doubly locked region, seems to the writer wholly untenable.

In the case I have recorded the cause, or causes, are not hard to find. They exactly accord with Dr. Little's graphic description of the cause of adolescent knock-knee. There are many reasons why Dr. Little's etiology, as applied to

the development of true scoliosis, should not be accepted. And I have ventured to place the case of John L. upon record as an illustration of this position.

I would like very much to take one step more in this connection, and dwell at length upon what I have come to think are the causes of lateral curvature. I am obliged, however, to desist, both on account of lack of time, and because I am now engaged in making certain tests and in conducting some experiments bearing upon the subject, which are still incomplete. In the lecture already referred to, I have said: "There is, undoubtedly, a localized or central neural lesion, which probably is developed early in life" in this condition. I can only reaffirm this conclusion on this occasion.

